

Claims

1. Inspection machine for printed matter in the form of printed sheets, such as securities, notes, banknotes, passports and other similar document, with a sheet feeder (1), wherein the machine comprises at least a first sheet inspection unit with an inspection cylinder (4) for transporting a printed sheet during inspection, an illumination means (5) and a camera (6) connected to an analysing device, an input transfer cylinder (3) to successively bring the printed sheets to the at least one inspection unit and an output transfer cylinder (17) to take away the printed sheets from the at least one inspection unit, wherein the inspection unit and the transfer cylinders are arranged in such a manner that the output transfer cylinder (17) takes away the inspected printed sheet only once the inspection of the sheet is completed.

2. A machine as claimed in claim 1, wherein said inspection cylinder (4) is a transparent cylinder, said illuminating means (5) are placed inside said cylinder and said camera (6) is placed outside said transparent cylinder for inspecting a printed sheet in transparency.

3. A machine as claimed in claim 1 or 2, further comprising a second sheet inspection unit comprising a second inspection cylinder (7) for transporting a printed sheet during inspection with a second illumination means (8) for illuminating said printed sheet and a second camera (9) for inspecting a first illuminated side of the printed sheet.

4. A machine as claimed in claim 3, wherein the second inspection unit is placed downstream of the first inspection unit and wherein said second inspection cylinder (7) is in direct contact with said first inspection cylinder (4).

5. A machine as claimed in claim 3 or 4, further comprising a third sheet inspection unit comprising a third inspection cylinder (12) for transporting a printed sheet during inspection with a third illumination means (13) for illuminating said printed sheet and a third camera (14) for inspecting a second illuminated side of the printed sheet.

6. A machine as claimed in claim 4, wherein the third inspection unit is placed downstream of the second inspection unit and wherein said third inspection cylinder (12) is in direct contact with said second inspection cylinder (7).

7. A machine as claimed in claim 5 or 6, wherein said second inspection unit and said third inspection unit each further comprise at least one non-visible feature inspection unit (10,11;15,16).

8. A machine as claimed in claim 7, wherein said non-visible feature inspection unit (10,11;15,16) comprise means for detecting IR, UV or magnetic properties on the printed sheets.

9. A machine as claimed in one of claims 1 to 8, wherein the inspection cylinders are carrying only one set of grippers each, and the diameter of the inspection cylinders is minimized for minimal transport and inspection time.

10. A machine as claimed in one of claims 1 to 9, wherein the transfer and inspection cylinders are arranged in a zigzag manner such that a transport length of a printed sheet on each inspection cylinder, between an input location where a printed sheet is transferred onto the inspection cylinder and an output location where the printed sheet is transferred away from the inspection cylinder is optimised for a given sheet length.

11. A machine as claimed in claim 10, wherein the transport length of the printed sheet on the inspection cylinder is slightly greater than the length of the printed sheet to be inspected.

12. A machine as claimed in any one of the preceding claims, further comprising a marking unit (19, 20) placed downstream of the output transfer cylinder (17) for marking defective sheets.

13. A machine as claimed in any one of the preceding claims, wherein the camera (6;9;14) is a linear camera that takes successive linear images of the printed sheet being inspected and which is synchronized with the sheet transport on the associated inspection cylinder (4;7;12).

14. A machine as claimed in claim 13, wherein each inspection cylinder comprises an encoder for synchronizing operation of the associated linear camera.

15. An inspection process for printed matter in the form of printed sheets, such as securities, notes, banknotes,

passports and other similar document, wherein the process comprises the following steps:

-) successive printed sheets to be inspected are transferred from a feeder into a first inspection unit in which a first inspection by transparency is carried out, the printed sheets being transported in said first inspection unit by a first inspection cylinder;

-) once the first inspection is terminated, the printed sheets are transferred to a second inspection unit in which a second inspection of a first side of the printed sheets is carried out, the printed sheets being transported in said second inspection unit by a second inspection cylinder;

-) once the second inspection is terminated, the printed sheets are transferred to a third inspection unit in which a third inspection of a second side of the printed sheets is carried out, the printed sheets being transported in said third inspection unit by a third inspection cylinder;

-) once the third inspection is terminated, the printed sheets are transferred in a marking unit and are marked as defective if the result of one of the inspection shows a defect; and

-) once marking has been performed, the printed sheets are transported in a delivery unit and sorted in delivery piles depending on whether or not the printed sheet are marked as being defective.

16. An inspection process according to claim 15, wherein said second and/or third inspection includes inspection of visible and/or invisible features on the printed sheets.

17. An inspection process according to claim 15 or 16, wherein transfer of the printed sheets from the first

inspection unit to the second inspection unit, and from the second inspection unit to the third inspection unit, is made directly from said first inspection cylinder to said second inspection cylinder, respectively from said second
5 inspection cylinder to said third inspection cylinder.

18. An inspection process as claimed in one of claims 15 to 17, wherein the diameter of the inspection cylinders is minimized for minimal transport and inspection time.

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19. An inspection process according to any one of claims 15 to 18, comprising the step of arranging the first, second and third inspection cylinders in such a manner that a transport length of a printed sheet on each inspection
15 cylinder, between an input location where a printed sheet is transferred onto the inspection cylinder and an output location where the printed sheet is transferred away from the inspection cylinder is optimised for a given sheet length.

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20. An inspection process as claimed in claim 18, wherein the transport length of the printed sheet on the inspection cylinder is selected to be slightly greater than the length of the printed sheet to be inspected.

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20. An inspection process according to any one of claims 15 to 19, wherein said first, second and third inspections include synchronizing operation of a linear camera that takes successive linear images of the printed sheet being
30 inspected with the sheet transport on the associated inspection cylinder.